Original Article

Amylase and Lipase Enzymes as Factors Affecting Acute Organophosphorous Poisoning Morbidity and Mortality

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ABSTRACT

The organophosphorous insecticides (OPIs) is widely used. The toxicity of OPIs is related to many biochemical disorders, for example changes in serum amylase and lipase enzymes. Average duration of admission affects prognosis of poisoning severity and outcome. The aim of this work was to evaluate the role of average days of admission, serum amylase and lipase enzymes in assessing OPIs poisoning severity, outcome, and complications in acutely OPIs poisoned patients admitted to Poison control center at Zagazig University Hospitals. This study was carried out on 36 OPIs poisoned patients on 7 months duration from May 2019 till November 2019. We scored the cases on first day of admission using POP score. Serum amylase and lipase were calculated on the day of admission and repeated after 24h. Results: Cases ranged between 3 and 66 years old with a mean age of 32.7±17.96. Serum amylase was correlated with OPIs poisoning severity, outcome, and complications, but not predictor of them. Serum lipase was not correlated with OPIs poisoning severity, outcome, and complications. Average days of admission were correlated with OPIs poisoning severity, outcome, and complications but predictor of outcome only. It is recommended to do further studies with large sample size for more accurate evaluation of the correlation with organophosphorous insecticides poisoning.

Keywords: Organophosphorous insecticides, amylase, lipase, poisoning severity, POP score.

I. INTRODUCTION

Organophosphorous insecticides (OPIs) are used worldwide and can also be used as chemical weapons with their associated compounds (King and Aaron, 2015). OPI poisoning is responsible for many morbidities and mortalities worldwide, especially in

developing countries, including Egypt. Their easy accessibility and lack of knowledge of their risks are the explanation for this high morbidity and mortality (Kim et al., 2013; Vijaya et al., 2010). The mortality rate could exceed 40% of all cases, even if adequately handled (Carey et al., 2013).

Organophosphorous insecticides interact by suppressing the cholinesterase enzyme (AChE) which enables acetylcholine (Ach) to accumulate massively within the synapse. This contributes to over-stimulation in the central and peripheral nervous systems of cholinergic receptors (nicotinic and muscarinic receptors), which causes the distinctive presentations of organophosphorous poisoning (El-Sheikh et al., 2018).

In OPIs toxicity, the cause of death is usually due to respiratory failure, but may also be due to other complications such as arrhythmia, pulmonary edema, pneumonia, pancreatitis, and renal failure (Lee et al., 2015).

Prognostic factors are observable outcome-related substances in people with a given illness or health disorder, including basic measures such as the index of body mass and sophisticated measures such as biomarkers. They can contribute to the diagnosis and can even estimate the response to treatment. Many variables can be used in acute OP poisoning to diagnose poisoning severity and fatality (Tang et al., 2016).

In the presentation, morbidity prediction may aid in decision-making in areas with limited resources, such as rural settings in developing countries (Ye et al., 2013).

Organophosphorous poisoning is associated with various biochemical abnormalities such as changes in serum amylase and lipase enzymes (Sumathi et al., 2014).

The aim of this work was to evaluate the role of amylase, lipase enzymes and average days of admission in assessing severity, outcome, and complications in acutely OPIs poisoned patients admitted to the poison control center (PCC) or intensive care units at Zagazig University Hospitals, which may help in improving the course of management and deciding the best pathway of care.

II. SUBJECTS AND METHODS

This prospective cohort study was carried out at the period between the

beginnings of May 2019 till the end of November 2019. Approval for performing the study was obtained from Forensic Medicine and Clinical Toxicology Department and Ethical committee of scientific research (Institutional Research Board "IRB"), Faculty of Medicine, Zagazig University (ZU-IRB # 5528, August 2019).

The selected patients of both sexes with acute OPIs exposure diagnosed through four criteria:

1. History of exposure to OPIs.

2. Characteristic toxic syndrome of OPIs toxicity.

3. Improvement of muscarinic symptoms and signs after atropine administration.

4. Low serum AChE activity.

Patients with any disease which can reduce AChE activity, patients with comorbidities as severe heart disease, heart failure, kidney disease, diabetes or cancer and patients who had received an intravenous injection of Ringer solution or sodium lactate Ringer solution prior to or within 6 h after admission to the hospital were excluded. As result to these exclusion criteria, this study included only 36 subjects. Informed consent from the patients about the study was obtained.

Personal history including name, age, sex and occupation, poisoning history including history of OPIs exposure, route of exposure, type of substance and treatment before arrival were obtained. In addition, we scored the cases on admission using Peradeniya Organophosphorous Poisoning (POP) scale.

Serum amylase, lipase and AChE were measured in Ultra laboratories, Zagazig branch, Egypt. Serum AChE was determined by colorimetric test, serum amylase was counted by a kinetic method using Spectrum (GALG2-CNP kit) and lipase was measured colorimetrically by kinetic method using (Spectrum DGMRE kit).

Statistical Designs:

Data were analyzed by Statistical Package of Social Science (SPSS), software version 20 (SPSS, Chicago, IL, USA, 2009). The comparison was done using ANOVA (analysis of variance) test, followed by Least Significance Difference test "LSD" for multiple comparisons between groups, student "t" test, paired t- test, chi-square

test, correlation co-efficient rank test, multiple linear regression analysis and Receiver operating characteristic curve (ROC) using the Area under the Curve (AUC), cut off points, sensitivity, specificity, positive predictive value, and negative predictive value.

For all above-mentioned statistical tests done, the threshold of significance was fixed at 5% level (P-value).

P value of > 0.05 indicates non-significant results.

P value of < 0.05 indicates significant results.

The smaller the P value obtained; the more significant results are.

III. RESULTS

This minimal risk prospective cohort study was conducted in Zagazig Poison Control Center (PCC) or intensive care unit (ICU) at Zagazig University Hospitals from the start of May 2019 till the end of November 2019.

Table (1) showed that the mean age of studied patients was 32.7 years and ranged from 3 to 66 years. Toxic substances and route of exposure are illustrated in table (2). It was found that 36.1% of toxic substances were unknown, 33.3% were chlropyrifos, 19.4% were malathion and 11.1% were parathion. In addition, ingestion represented 69.4%. While, dermal and inhalation represented 30.6%.

Table (3) clarified that 61.1% of studied patients had moderate toxicity, 25% had mild toxicity, while 13.9% had severe toxicity according to POP score. Also, 86.1% were discharged compared to 13.9% died. Moreover, 80.6% had no complications compared to 19.4% had complications. These complications were cardiac arrest and shock (5.6%), chest infection (8.3%), coma (2.8%) and seizures (2.8%).

Table (4) showed that there was statistically significant (P<0.05) relation between age of the studied patients and severity according to POP score. While there was no statistically significant (P>0.05) relation between sex and severity. Table (5) showed that there was statistically highly significant (P<0.001) relation between route of exposure and severity according to POP score. While there was no statistically significant (P>0.05) relation between toxic substances and severity.

Table (6) showed that there was no statistically significant (P>0.05)

relation between age and sex of the studied patients and outcomes. Table (7) showed that there was no statistically significant (P>0.05) relation between toxic substances and route of exposure and outcomes. Table (8) showed that there was no statistically significant (P>0.05) relation between age and sex of the studied patients and complications.

Table (9) showed that there was statistically significant (P<0.05) relation between route of exposure and complications. While there was no statistically significant (P>0.05) relation between toxic substances and complications. Table (10) illustrated that there was statistically highly significant (p<0.01) difference among patients had mild, moderate, and severe toxicity as regard mean values of amylase on admission and post 24hours and average days of admission using ANOVA test while lipase showed non-significant difference on admission and post 24hours.

Table (11) illustrated that there was statistically highly significant (p<0.001) increase in average days of admission of dead patients compared to discharged patients. While there was not statistically significant (P>0.05) difference between dead and discharged patients as regard mean values of amylase and lipase on admission and post 24hours using student t- test.

Table (12) illustrated that there was statistically highly significant (p<0.001) increase in average days of admission in patients who had complications compared to patients without complications. While there was not statistically significant (P>0.05) difference between both groups as regard mean values of amylase and lipase on admission and post 24hours using student t- test.

Table (13) showed that there was a positive highly significant (p<0.001) correlation between amylase, days of admission and severity. However, there was no significant (p>0.05) correlation between lipase and severity. Table (14) showed that there was a positive highly significant (p<0.001) correlation between all studied parameters and outcomes except lipase.

Table (15) showed that there was a positive highly significant (p<0.001) correlation between POP, amylase, days of admission and complications. However, there was no significant (p>0.05) correlation between lipase and complications.

Table (16) showed that amylase, lipase, and days of admission could not be used in severity prediction. Table (17) showed that days of admission were highly statistically significant ($p<0.001$) predictors of outcome of organophosphate poisoning. While POP, amylase, and lipase could not be used in outcome prediction.

ROC curve analysis to assess the predictors of severity of OP poisoning (Table 18) and fig. (1) showed that the area under the curve for days of admission was 0.977. Also, it was found that days of admission at cut off > 5.5 had sensitivity 80% and specificity 96.8%.

Table (19) showed that POP, amylase, lipase, and days of admission could not be used in complications prediction.

Table 1: Frequency of age and sex of studied organophosphorous poisoned patients at Zagazig University Hospitals from May 2019 till November 2019

		No.	Percent
Age in years	<20	11	30.6
	20-40	9	25.0
	>40-60	14	38.9
	>60	2	5.6
	Mean ±SD	32.7±17.96	
	Range	3-66	
Sex	Male	25	69.4
	Female	11	30.6

SD: standard deviation; n: number of subjects

Table 2: Frequency of toxic substances and route of exposure to organophosphorous insecticides at Zagazig University Hospitals from May 2019 till November 2019

		No.	Percent
Toxic substances	Chlropyrifos 22, 40 and48%	12	33.3
	Malathion 5, 8, 20%	7	19.4
	Parathion 20,8%	4	11.1
	Unknown	13	36.1
Route of exposure	Dermal and inhalation	11	30.6
	Ingestion	25	69.4

n: number of subjects

Table 3: Distribution of organophosphorous poisoned patients according to Severity (POP score), outcomes and complications at Zagazig University Hospitals from May 2019 till November 2019

		No.	Percent
Severity according to POP score	Mild	9	25.0
	Moderate	22	61.1
	Severe	5	13.9
Outcomes	Discharged	31	86.1
	Died	5	13.9
Complications	Not Complicated	29	80.6
	Complicated	7	19.4
Types of Complications	Cardiac (Arrest and shock)	2	5.6
	Chest infection	3	8.3
	Others	1	2.8
	Coma	1	2.8
	Seizures		

n: number of subjects POP score: Peradeniya Organophosphorous Poisoning

Table 4: Relation between age and sex of the studied organophosphorous poisoned patients and severity according to POP score using Chi-Square test at Zagazig University Hospitals from May 2019 till November 2019

Parameters		Severity according to POP score						χ^2	P-value
		Mild (n=9)		Moderate (n=22)		Severe (n=5)			
		No.	%	No.	%	No.	%		
1-Age in years	<20 (n=11)	0	0.0	11	100	0	0.0	15.78	0.015*
	20-40(n=9)	3	33.3	3	33.3	3	33.3		
	>40-60 (n=14)	6	42.9	7	50.0	1	7.1		
	>60 (n=2)	0	0.0	1	50.0	1	50.0		
2- Sex	Male (n=25)	9	36.0	13	52.0	3	12.0	5.28	0.071#
	Female (n=11)	0	0.0	9	81.8	2	18.2		

#: statistically non-significant (p>0.05). *: statistically significant (P<0.05).
n: number of subjects POP score: Peradeniya Organophosphorous Poisoning

Table 5: Relation between toxic substances and route of exposure and severity according to POP score at Zagazig University Hospitals from May to November 2019 using Chi-Square test

Parameters		Severity according to POP score						χ^2	P-value
		Mild (n=9)		Moderate (n=22)		Severe (n=5)			
		No.	%	No.	%	No.	%		
1- Toxic substances	Chlorpyrifos 22, 40 and48% (n=12)	1	8.3	7	58.3	4	33.3	9.444	0.150#
	Malathion 5, 8, 20% (n=7)	1	14.3	5	71.4	1	14.3		
	Parathion 20,8% (n=4)	2	50.0	2	50.0	0	0.0		
	Unknown (n=13)	5	38.5	8	61.5	0	0.0		
2- Route of exposure	Dermal and inhalation (n=11)	8	72.7	3	27.3	0	0.0	19.6	<0.001**
	Ingestion (n=25)	1	4.0	19	76.0	5	20.0		

#: statistically non-significant (p>0.05). **: statistically highly significant (P<0.001).
n: number of subjects POP score: Peradeniya Organophosphorous Poisoning

Table 6: Relation between age and sex of the studied organophosphorous poisoned patients and outcomes at Zagazig University Hospitals from May to November 2019 using Chi-Square test

Parameters		Outcomes				χ^2	P-value
		Discharged (n=31)		Died (n=5)			
		No.	%	No.	%		
1-Age in years	<20 (n=11)	10	90.9	1	9.1	3.9	0.271#
	20-40(n=9)	6	66.7	3	33.3		
	>40-60 (n=14)	13	92.9	1	7.1		
	>60 (n=2)	2	100.0	0	0.0		
2- Sex	Male (n=25)	23	92.0	2	8.0	2.4	0.123#
	Female (n=11)	8	72.7	3	27.3		

#: statistically non-significant (p>0.05). n: number of subjects

Table 7: Relation between toxic substances and route of exposure and outcomes at Zagazig University Hospitals from May to November 2019 using Chi-Square test

Parameters		Outcomes				χ^2	P-value
		Discharged (n=31)		Died (n=5)			
		No.	%	No.	%		
1- Toxic substances	Chlorpyrifos 22, 40 and48% (n=12)	9	75.0	3	25.0	2.3	0.512#
	Malathion 5, 8, 20% (n=7)	6	85.7	1	14.3		
	Parathion 20,8% (n=4)	4	100.0	0	0.0		
	Unknown (n=13)	12	92.3	1	7.7		
2- Route of exposure	Dermal and inhalation (n=11)	11	100.0	0	0.0	2.56	0.11#
	Ingestion (n=25)	20	80.0	5	20.0		

#: statistically non-significant (p>0.05).

Table 8: Relation between age and sex of the studied organophosphorous poisoned patients and complications at Zagazig University Hospitals from May to November 2019 using Chi-Square test

Parameters		Complications				χ^2	P-value
		Not Complicated (n=29)		Complicated (n=7)			
		No.	%	No.	%		
1-Age in years	<20 (n=11)	10	90.9	1	9.1	3.29	0.35#
	20-40(n=9)	6	66.7	3	33.3		
	40-60 (n=14)	12	85.7	2	14.3		
	>60 (n=2)	1	50.0	1	50.0		
2- Sex	Male (n=25)	21	84.0	4	16.0	0.62	0.43#
	Female (n=11)	8	72.7	3	27.3		

n: number of subjects #: statistically non-significant (p>0.05).

Table 9: Relation between toxic substances and route of exposure and complications at Zagazig University Hospitals from May to November 2019 using Chi-Square test

Parameters		Complications				χ^2	P-value
		Not Complicated (n=29)		Complicated (n=7)			
		No.	%	No.	%		
1- Toxic substances	Chlorpyrifos 22, 40 and48% (n=12)	7	58.3	5	41.7	6.014	0.111#
	Malathion 5, 8, 20% (n=7)	6	85.7	1	14.3		
	Parathion 20,8% (n=4)	4	100.0	0	0.0		
	Unknown (n=13)	12	92.3	1	7.7		
2- Route of exposure	Dermal and inhalation (n=11)	11	100.0	0	0.0	3.8	0.05*
	Ingestion (n=25)	18	72.0	7	28.0		

#: statistically non-significant (p>0.05). *: statistically significant (P<0.05).
n: number of subjects

Table 10: Comparison among mild, moderate, and severe groups as regard mean values of amylase, lipase (on admission and post 24hours) and average days of admission at Zagazig University Hospitals from May 2019 to November 2019 using ANOVA and paired t-test

Parameters	Periods in hours	Mild(n=9)	Moderate(n=22)	Severe(n=5)	F	P1
		Mean ±SD				
Amylase (U/L)	0 hrs.	56.56±12	69.05±15.68	177.6±151	9.361	0.001**
	24 hrs.	48.67±14	51.27±10.56	95.6±79.67	4.960	0.01**
	Paired-t	1.703	5.033	2.11		
	P2	0.127#	<0.001**	0.102#		
24 hrs.	0 hrs.	32.56±7.5	30.95±8.18	40.2±22.73	1.467	0.245#
		34.67±8.2	37.73±6.91	28.8±9.68	2.909	0.069#
	Paired-t	0.590	2.970	1.43		
	P2	0.571#	0.007**	0.23#		
Days of admission		2.1±0.33	3.41±1.01	8.6±5.98	14.388	<0.001**

N.B All values are expressed as mean ±SD. (SD: standard deviation) #: statistically non -significant (p>0.05) *: statistically highly significant (p<0.05) **: statistically highly significant (p<0.01) (P1: P of F test, P2: P of Paired t- test) hrs.: hours n: number of subjects

Table 11: Comparison between discharged and died groups as regard mean values of amylase, lipase (on admission and post 24hours) and average days of admission at Zagazig University Hospitals from May 2019 till November 2019 using student t-test

Parameters	Discharged (n=31)	Died (n=5)	T	P
amylase (U/L) (on admission)	67.74±21.42	163.2±157.67	1.35	0.247#
amylase (U/L) (Post 24)	49.9±12.31	99.4±75.75	1.458	0.218#
lipase (U/L) (on admission)	32.8±11.48	31.8±8.70	0.181	0.858#
lipase (U/L) (Post 24)	36.7±7.26	29.4±10.53	1.975	0.056#
Days of admission	2.94±0.89	9.2±5.4	6.4	<0.001**

N.B All values are expressed as mean ±SD. (SD: standard deviation) n: number of subjects #: statistically non-significant (p>0.05) **: statistically highly significant (p<0.001)

Table 12: Comparison between not complicated and complicated groups as regard mean values of amylase, lipase (on admission and post 24hours) and days of admission from May to November 2019 at Zagazig University Hospitals by student t-test

Parameters	Not Complicated (n=29)	Complicated (n=7)	T	P
Amylase (U/L) (On admission)	٦٤.٦٢±15.7	148.9±132.59	1.678	0.144#
Amylase (U/L) (Post 24)	50.2±11.36	83.9±68.38	1.296	0.242#
Lipase (U/L) (On admission)	30.9±7.85	39.85±18.64	1.245	0.256#
Lipase (U/L) (Post 24)	36.7±7.49	31.85±9.58	1.441	0.159#
Days of admission	2.93±0.9	7.4±5.3	4.45	<0.001**

All values are expressed as mean ±SD. (SD: standard deviation) n: number of subjects #: statistically non-significant (p>0.05) **: statistically highly significant (p<0.001)

Table 13: Pearson's correlation coefficient statistical test of severity and Amylase, Lipase, and days of admission.

Parameters	Severity (POP score)	
	R	P
Amylase (U/L)	0.467	0.004**
Lipase (U/L)	0.152	0.377#
Days of admission	0.540	<0.001**

#: statistically non-significant (p>0.05) **: statistically highly significant (p<0.001), r: correlation coefficient POP score: Peradeniya Organophosphorous Poisoning

Table 14: Pearson's correlation coefficient statistical test of outcomes and POP score, amylase, lipase, and days of admission.

Parameters	**Outcomes**	
	R	P
POP score	0.545	0.001**
Amylase (U/L)	0.529	0.001**
Lipase (U/L)	-0.205	0.230#
Days of admission	0.739	<0.001**

#: statistically non-significant (p>0.05) **: statistically highly significant (p<0.001) r: correlation coefficient POP score: Peradeniya Organophosphorous Poisoning

Table 15: Pearson's correlation coefficient statistical test of complications and POP score, amylase, lipase, and days of admission.

Parameters	complications	
	R	p-value
POP score	0.711	0.001**
Amylase (U/L)	0.492	0.002**
Lipase (U/L)	0.117	0.495#
Days of admission	0.607	<0.001**

#: statistically non-significant (p>0.05) **: statistically highly significant (p<0.001)
r: correlation coefficient POP score: Peradeniya Organophosphorous Poisoning

Table 16: Multiple regression analysis for factors predicting severity.

Model	Unstandardized Coefficients		Standardized Coefficients	t	p-value
	B	Std. Error	Beta		
(Constant)	1.932	1.357		1.424	0.165
Days of admission	-0.003	0.065	-0.005	-0.053	0.958#
Amylase	-0.006	0.004	-0.147	-1.509	0.142#
Lipase	0.021	0.020	0.079	1.056	0.300#

#: statistically non-significant (p>0.05) **: statistically highly significant (p<0.001)

Table 17: Multiple regression analysis for factors predicting outcome

Model	Unstandardized Coefficients		Standardized Coefficients	t	p-value
	B	Std. Error	Beta		
(Constant)	-0.631	0.300		-2.102	0.045
POP score	0.045	0.040	0.248	1.121	0.272#
Amylase	0.001	0.001	0.171	1.442	0.161#
Lipase	-0.005	0.004	-0.107	-1.199	0.241#
Days of admission	0.045	0.014	0.384	3.282	0.003**

#: statistically non-significant (p>0.05) **: statistically highly significant (p<0.001)
POP score: Peradeniya Organophosphorous Poisoning

Table 18: Sensitivity, specificity, and accuracy rate of predictor of outcome

Parameters	Cut off point	AUC	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Accuracy rate (%)
Days of admission	>5.5	0.977	80.0	96.8	80.0	96.8	94.4

AUC: Area under Curve (Receiver Operating Curve), PPV: Positive Predictive Value, NPV: Negative Predictive Value

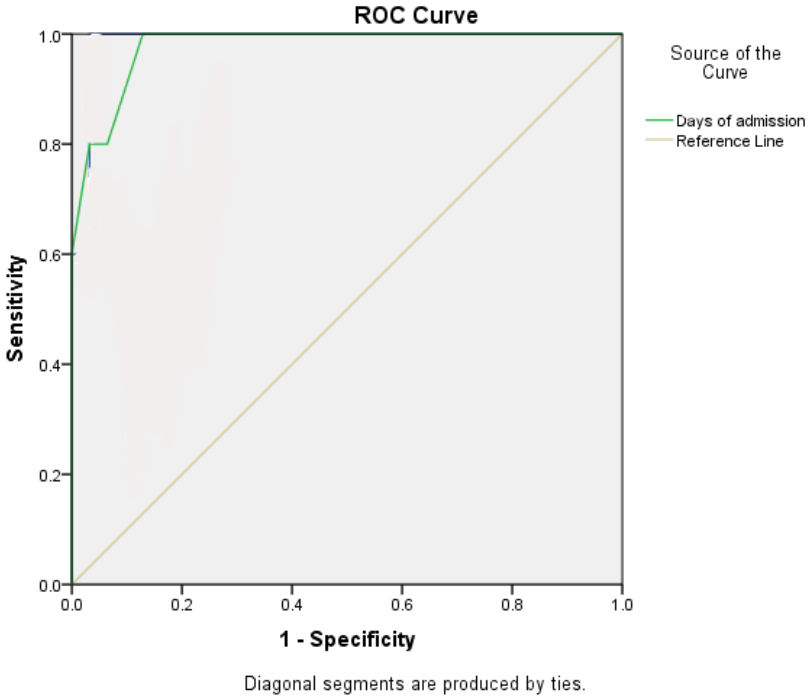

Figure (1): ROC curve analysis to assess the predictors of outcome of OPIs poisoning

Table 19: Multiple regression analysis for factors predicting complications

Model	Unstandardized Coefficients		Standardized Coefficients	t	p-value
	B	Std. Error	Beta		
(Constant)	-0.894	0.488		-1.832	0.078
POP score	0.076	0.066	0.363	1.156	0.258#
Amylase	0.001	0.001	0.165	0.979	0.336#
Lipase	0.008	0.007	0.138	1.088	0.286#
Days of admission	0.042	0.022	0.311	1.873	0.072#

#: statistically non-significant (p>0.05) **: statistically highly significant (p<0.001)
POP score: Peradeniya Organophosphorous Poisoning

IV. DISCUSSION

Toxicity with OPIs is a major health problem(Alejo-González et al., 2018). Organophosphates are potent inhibitors of acetyl cholinesterase. As a result, the acetylcholine substrate is accumulated. Continued stimulation causes clinical signs and symptoms of organophosphate poisoning, including muscarinic, nicotinic, and central nervous system (El- Naggar et al., 2009).

Diagnosis of OPIs poisoning is mainly clinical and needs an experienced clinician and high index suspicion. It is confirmed by decrease in the level of cholinesterase enzyme (El- Naggar et al., 2009). Any delay in the diagnosis of poisoning may lead to insufficient treatment, and increase mortality rates of these cases (Lee and Tai, 2001).

Senanayeke et al. (1993) and Chaudhary et al. (2019) have shown that the POP score can effectively access the intensity, morbidity and mortality of OPIs poisoned patients. POP score is a useful predictor of severity of OPIs poisoning. So, in this study, we have used POP score as severity indicator then it was used to find the association between the severity of poisoning and other parameters like amylase and lipase enzymes.

In the present study, the overall mortality rate was 13. 9 %. These results goes parallel with Gunduz et al. (2015) who reported mortality rate of 13.9 % in their study. Another study done at Zagazig University Hospitals where mortality rate reached 11.53 % (Amin et al., 2018). Also, Moussa et al. (2018) study which performed at Ain Shams University Hospitals reported mortality rate by 10 %.

In the current study, the incidence rate of complications was 19. 4 % and the most common complications were chest complications in 8.3 % of all cases followed by cardiac complications in 5.6 % of all cases, while coma in 2.8 % and seizures in 2.8 % of cases. Bilal et al. (2014) agreed with these results, Moreover, Gunduz et al. (2015) study found that the cause of death was respiratory failure in 68 % of died cases followed by cardiac arrest in 20%, then renal failure 12%. Moreover, Chintale et al. (2016) confirmed that respiratory failure was the most common complication.

Hulse et al. (2014) explained that most fatalities after OPIs poisoning occur due to hypoxia caused by a combination of acute cholinergic effects with central apnea. Other deaths have occurred later due to cardiovascular shock, neuromuscular junction (NMJ) dysfunction, or complications of decreased level of consciousness.

As a result of the present study, the rise in serum amylase level on admission coincided with severity. However, there was no significant relation between serum amylase and outcome or complications. In addition, serum amylase had a positive highly significant correlation with severity, outcome, and complications.

Similar results recorded that acute pancreatitis was not a rare complication of OPIs poisoning and hyperamylasemia was more frequently seen in OPIs (Chaturvedi, 2014; Şahin et al., 2002). Sumathi et al.(2014) reported a significant association of elevation of amylase level with the severity of OPIs poisoning. This may be due to the fact that acute pancreatitis is caused by excessive cholinergic stimulation of the pancreas by OPIs.

Also, our results agreed with Adhil and Sudharsan (2015) who declared that serum amylase may be used as a marker for detection of the severity in OPIs intoxication. Serum amylase level can allow early detection of severity and the identification of those at risk of developing complications in organophosphorous poisoning, so that it can be used as a useful biomarker in OPIs patients (Mahto, 2019; Salame and Wani, 2017). In addition, Sert et al.(2018) have been found elevated amylase in their study and the high values were related to the death rates.

In addition, Nagabhiru (2020) reported significant increase in the level of serum amylase after OPIs poisoning patients whose suffer from complications such as seizures, depression, fasciculation, respiratory disorders, and poor outcome with these cases and concluded that serum amylase levels can be interpreted as a marker for the toxicity of OPIs.

Patients with elevated serum amylase had normal serum lipase, so hyperamylasemia was suggested to be from salivary origin and not from pancreatic origin (Gokel et al., 2002). Elevated amylase level in OPIs poisoned patients may be explained by

excessive stimulation of muscarinic receptors leading to hyper secretion of salivary glands (Sung et al., 1998).

However, Koirala et al. (2019) found that all patients with OPIs poisoning had elevation in serum amylase level but the level did not proportionate with the severity of poisoning assessed by POP score, and this increase in serum amylase usually decreases or regains to normal in survived patient at period of admission.

The results of our study revealed that, there was no difference in serum lipase level with the change of severity of poisoning on admission or after 24 h. Also, there was no relation between serum lipase level and both outcome and complications. In addition, there was no significant correlation between serum lipase and severity, outcome, or complications.

These results are matched with Sumathi et al. (2014), who reported that serum lipase didn't show any significant correlation with AChE or OPIs poisoning severity. Unlike our results, Adhil and Sudharsan (2015) and Moussa et al. (2018) showed significant correlation between lipase and severity of poisoning. This difference in results may be related to limited number of cases in our study.

The average days of admission were increased with the increase of the severity. There was an increase in days of admission on both died and complicated groups than survivors and non-complicated groups. In addition, there was a positive highly significant correlation between days of admission and severity. There was a positive highly significant correlation between days of admission and outcome, also between days of admission and complications. By using multiple regression analysis, days of admission was statistically highly significant predictor of the outcome.

These results were in agreement with Lee and Tai (2001) who reported that the length of ICU stay had a significant correlation with the patient severity. Also, Rehiman et al. (2008) stated that days of hospitalization were useful for assessing the severity of OPIs poisoned cases. Dong et al. (2020) observed that patients with high APACHE II score and SOFA score needed longer duration of hospital stay.

Our results agreed with Sert et al. (2018) who concluded that mortality depends on the degree of poisoning

severity, and the length of mechanical ventilation. On the other hand, our results differ from Sam et al. (2009), who reported non-significant correlation was observed between poisoning severity and the hospitalization period.

V. CONCLUSION

Poisoning with OPIs is a major health problem mainly in developing countries like Egypt especially in rural areas due to their availability. There was a positive highly significant correlation between serum amylase and severity, outcome, and complications, but not predictor of neither of them. Also, there was no relation between serum lipase level and severity, outcome, and complications. The average days of admission were related to poisoning severity, outcome, and complications. A positive highly significant correlation was found between days of admission and severity, outcome, and complications. Days of admission was statistically highly significant predictor of the outcome.

VI. RECOMMENDATIONS

On the light of the results of the present study, we recommend Using days of admission as predictors of OPIs poisoning outcome. Using serum amylase and lipase level on admission and repeating them are not beneficial. Furthers studies to find more accepted predictor for OPIs poisoning.

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الملخص العربي

إنزيمات الأميليز والليبيز كعوامل تؤثر على معدلات الاعتلال والوفيات الناتجة عن التسمم العضوي الفوسفوري الحاد

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تستخدم المبيدات الحشرية الفسفورية العضوية على نطاق واسع. ترتبط سمية هذه المبيدات بالعديد من الاضطرابات الكيميائية الحيوية على سبيل المثال التغيرات في إنزيمات الأميليز والليبيز في الدم. متوسط مدة الاقامه بالمستشفي يؤثر على تشخيص شدة التسمم ونتائجه. كان الهدف من هذا العمل هو تقييم دور متوسط أيام الاقامه بالمستشفي وإنزيمات الأميليز والليباز في الدم في تقييم شدة التسمم بالمبيدات الحشرية الفسفورية العضوية ونتائجه ومضاعفاته لدى مرضى التسمم الحاد الذين تم إدخالهم إلى مركز مكافحه السموم بمستشفيات جامعة الزقازيق. تم إجراء هذه الدراسة على ٣٦ مريضًا مصابًا بالتسمم بالمبيدات الحشرية الفسفورية العضوية علي مدار ٧ أشهر من مايو ٢٠١٩ حتى نوفمبر ٢٠١٩. وسجلنا الحالات في اليوم الأول من الدخول باستخدام مقياس البوب. تم قياس الأميليز والليباز في يوم الدخول وتكرر بعد ٢٤ ساعة. النتائج: الحالات تراوحت بين ٣ و ٦٦ سنة بمتوسط عمر ٣٢.٧ ± ١٧.٩٦. ارتبط إنزيم الأميليز بخطورة التسمم ونتائجه ومضاعفاته ، ولكن ليس مؤشرًا لاي منهم. لم يكن الليبيز مرتبطًا بشدة التسمم والنتيجة والمضاعفات. ارتبط متوسط أيام الاقامه مع شدة التسمم والنتيجة والمضاعفات ولكن مؤشر للنتيجة فقط. يوصى بإجراء المزيد من الدراسات مع حجم عينة كبير لإجراء تقييم أكثر دقة للعلاقة مع التسمم بالمبيدات الحشرية الفوسفورية العضوية.